Take Your Application Global

Session 141

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Application Technologies

Take Your Application Global

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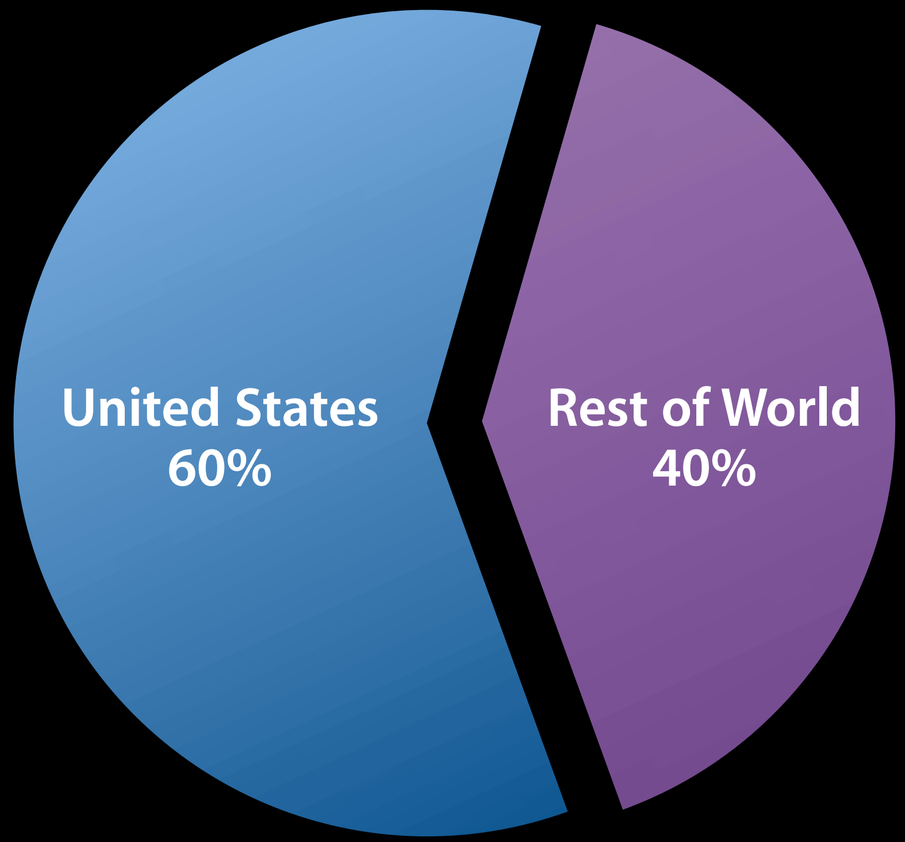
http://developer.apple.com/wwdc2005/

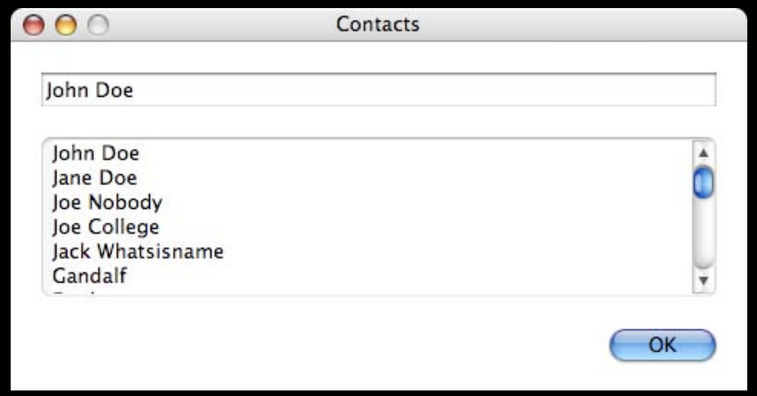
Why Should You Care?

Apple Revenue by Region, Q1 2005



Introduction

- Localization (“L10N”)
  - Preparing an application for a particular market
- Internationalization (“I18N”)
  - Making an application ready to support any market and any language
- More than translation of user interface
  - Processing of data in multiple languages
  - Support for other countries and cultures
  - Avoiding cultural *faux pas*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Jane Doe
Joe Nobody
Joe College
Jack Whatsisname
Gandalf
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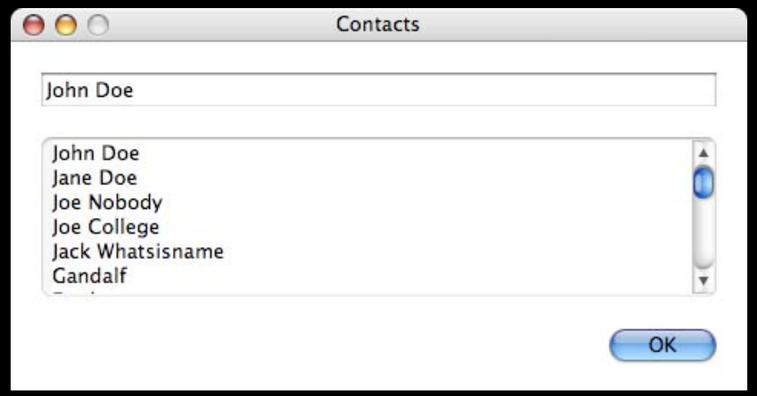
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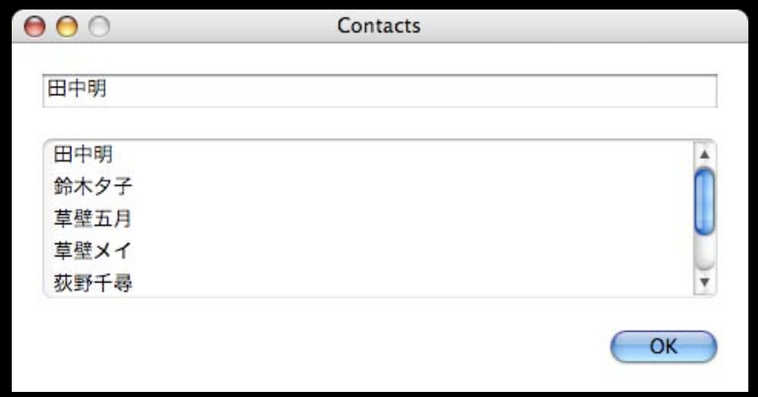
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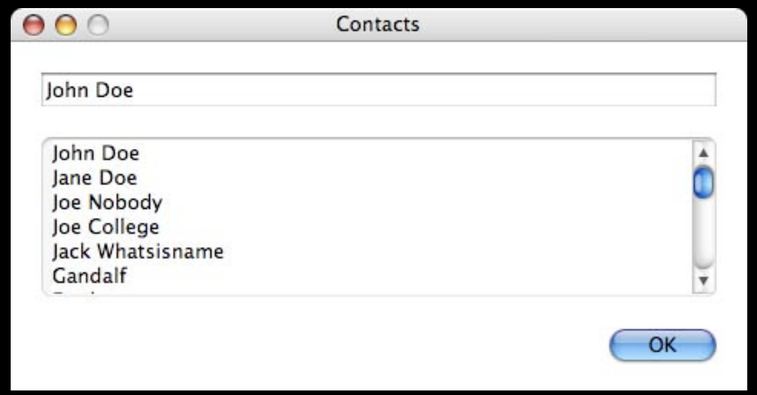
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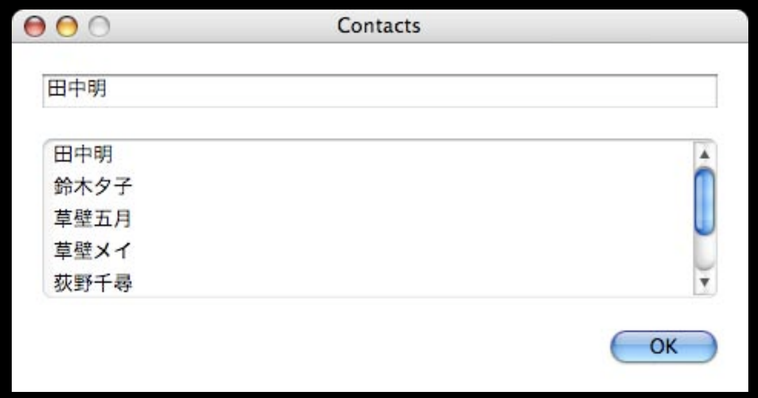
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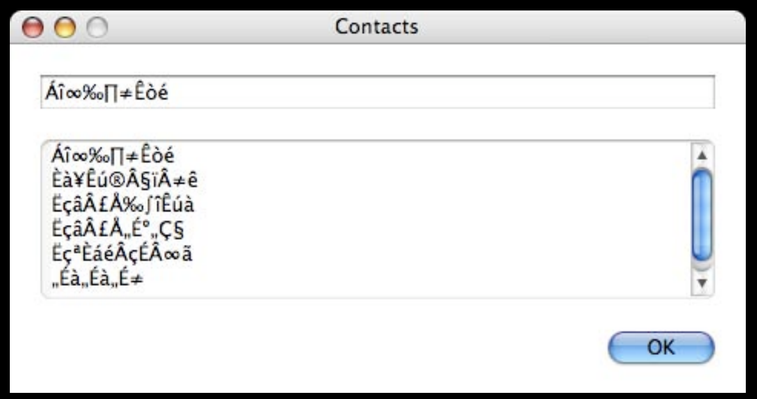
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Ideal Global Application

- Handles content in any combination of languages
- Can be localized into any set of languages
- Handles complex and bidirectional writing systems
- Uses local conventions for
  - Dates and times
  - Numbers
  - Calendars
  - Sorting and searching
  - Text boundaries (words, lines, characters)

What You'll Learn

- Which APIs to use for all aspects of your application:
  - Text storage and access
  - Human Interface and localization
  - Drawing, editing, and input
  - Sorting and searching
  - Analyzing and modifying text
  - Dates, times, numbers, and calendars
- Where to look, not detailed recipes
  - "If it's Tuesday, this must be CFString"

International: What's New in Tiger

- OpenType font layout table support
  - If you use Unicode APIs to draw, it just works!
  - Roman and Japanese for Tiger
- String transliteration API

  北京 ⇒ běi jīng
- Unicode type-selection API
- More font Unicode coverage
  - Extended Roman, Extended Greek, Cyrillic in core fonts
  - Tamil, Braille, Yijing Hexagram Symbols, Tai Xuan Jing Symbols
- Tamil input method; Polytonic Greek, Maori, Nepali, other keyboards
- More locale data available (open source— `http://www.unicode.org/cldr/`)

What's New in Tiger, (Cont.)

- New options for number/date/time formatting
  - Number spellout, finer control, calendar calculations
    - "One hundred and twenty-three point four five"
    - `NSCalendar/CFCalendar`
    - `NSDatePicker`
- Non-Gregorian calendars
  - Japanese, Thai Buddhist, Islamic, Hebrew

    January 5, 17 Heisei

    January 5, 2547 BE

    Duh'l-Qi'dah 24, 1425

    Tevet 24, 5765

Demo

John Jenkins

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Text Storage and Access

http://developer.apple.com/wwdc2005/

Unicode in 60 Seconds

- One character set for the world
- Over 96,000 characters
- UTF-16: 16 bit units
  - One Unicode code *point* can require one or two UTF-16 code *units*

    丈 U+2000B = 0xD840 0xDC0B
- One user character (”grapheme” or “cluster”) may be many Unicode code points

  R e ◌́ s u m e ◌́ ⇒ Résumé

  V i e ◌̣ ◌̂ t ⇒ Việt
- Multiple “spellings”
  - Pre-composed (NFC) vs. decomposed (NFD) vs. mixture
  - Résumé — Re◌́sume◌́ — Résume◌́

Data Types

- UTF-16 code unit (`UniChar, unichar`)
  - Type for element of UTF-16 array
  - Ok unless you need to process individual code points
- Unicode code point (`UnicodeScalarValue, UTF32Char`)
  - Essential when processing individual code points, e.g. for character properties
- Core Foundation string
  - `CFStringRef, CFMutableStringRef, CFAttributedStringRef`
- Cocoa string (toll free bridge with Core Foundation)
  - `NSString, NSMutableString, NSAttributedString`
- All are native-endian
- External representation is big-endian or has BOM

Storing Your Text

- `CFString, CFMutableString, CFAttributedString` *New!*
- `UniChar *`

`CFStringCreateWithCharacters (NULL, myUniChars, count);`	Create a string from UTF-16 (`UniChar`) array
`CFStringGetCharacterFromInlineBuffer (&buf, index);`	Fast access to string contents
`CFAttributedStringCreate(NULL, cfstring, attributes);`	Create an attributed string with dictionary of arbitrary attributes
`CFAttributedStringGetAttributes (attrString, at, &range);`	Return dictionary of arbitrary attributes at index, and range of run

Finding a Safe Place to Break

- Don’t break in the middle of a user character!

  V|i|e◌̣◌̂|t (Việt)

- For processing/scanning only, not word or line break
- `CFStringGetRangeOfComposedCharactersAtIndex`
- `UCFindTextBreak (kUCTextBreakClusterMask)`

```
// Example: move potential break point to end of cluster
result = CFStringGetRangeOfComposedCharactersAtIndex(myString, index);
CFIndex break = result.location + result.length;
```

Handling External Data

- Older, non-Unicode document formats and Internet Protocols
- Make sure to choose the right encoding:
  - ASCII or UTF-8 for hardwired text (e.g., file names in bundle)
  - CFStringGetSystemEncoding() for legacy plain text documents
  - Based on font script (for each run) for legacy styled text documents
  - Based on MIME (IANA) charset for data from Internet

`CFStringCreateWithCString(NULL, cstr, encoding)`	To Unicode; CFStringCreateWithBytes for more control
`CFStringGetSystemEncoding()`	User's preferred text encoding
`ATSFontFamilyGetEncoding(family)`	Get the text encoding corresponding to a font
`CFStringConvertIANACharSetNameTo Encoding(string)`	Get the text encoding for a MIME charset

Human Interface and Localization

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Structuring Your Application

- Application bundle
  - Localized and non-localized files
  - Localized files in *lang*.lproj directory
    - en.lproj, ja.lproj, tlh.lproj
  - Any kind of file: .nib, .strings, .jpeg, .mov, .rtf
- Interface Builder nib files
  - Contain UI elements
  - `CreateNibReference`, `CreateMenuBarFromNib`, `CreateMenuFromNib`, `CreateWindowFromNib`

Getting Localized Strings

- `CFCopyLocalizedString`
- `Localized.strings` file, in UTF-8 or UTF-16

```
// en.lproj/Localized.strings file
"string1" = "Are you sure you want your computer to melt into a puddle?";
"string2" = "Yes";

// ja.lproj/Localized.strings file
"string1" = "コンピューターがメルトダウンしてもいいですか？";
"string2" = "はい";

// Getting the string
CFStringRef warning;
warning = CFCopyLocalizedString(CFSTR("string1"), "CPU meltdown warning");
```

Take Your Application Global

Deborah Goldsmith
International, Unicode Liaison

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Drawing and Editing Text

http://developer.apple.com/wwdc2005/

Text Editing Engines

- Multilingual Text Engine—MLTE
  - See “Handling Unicode Text Editing With MLTE”
  - New: can specify encoding when importing, exporting plain text
- `HITextView`
- `EditUnicodeTextControl`

`HITextViewCreate`	Create an HIView that wraps an MLTE object
`HITextViewGetTXNObject`	Get the underlying MLTE object to do other things: save, open, advanced features
`CreateEditUnicodeTextControl`	Creates a control that fully supports Unicode editing

Unicode Text Rendering Is Complex

- Normalization (pre-composed, decomposed, mixed)
- Complex scripts (Thai, Arabic, Indic, others)

  ह ि न् द ी ⇒ हिन्दी

- Bidirectional (Arabic, Hebrew)
- Ligatures, typographic features

  Zapfino ⇒

- Do not attempt at home

Handling Bidirectional Text

- Unicode uses bidirectional algorithm
  - Operates on a paragraph at a time
  - LTR vs. RTL runs based on content
  - Overall direction implicit or explicit
- Unicode APIs like ATSUI or `HIThemeDrawTextBox` takes care of all this for you
- But, must process/draw one paragraph (not run) at a time

Drawing Short Strings

- Labels, etc.

`HIThemeDrawTextBox(cfstring, ...)`	When theme fonts are OK
`TXNDrawCFStringTextBox(cfstring, ...)`	Gives more control over fonts, CGContext, rotation, etc.
`TXNDrawUnicodeTextBox(buffer, count, ...)`	Works with `UniChar *` strings

Drawing Large Amounts of Text

- ATSUI: Apple Type Services for Unicode Imaging
- See “Rendering Unicode Text With ATSUI”
- Opaque objects for:
  - Layout (typically a paragraph or document): `ATSUTextLayout`
  - Styles: `ATSUStyle`
- Easily customizable
- Can get glyph array to use with CoreGraphics

Receiving User Text Input Directly

- `NewTSMDocument` with `kUnicodeDocumentInterfaceType`
- Input via `kEventClassTextInput` CarbonEvents—avoid `kEventClassKeyboard`

`kEventTextInputUnicodeForKeyEvent`	CarbonEvent with Unicode text
`kEventTextInputUpdateActiveInputArea`, `kEventTextInputOffsetToPos`, `kEventTextInputPosToOffset`, `kEventTextInputGetSelectedText`	CarbonEvents for inline input support
`kEventClassTSMDocumentAccess`	CarbonEvents for input method access to document content — better accuracy, more features

Analyzing and Modifying Text

http://developer.apple.com/wwdc2005/

Sorting and Searching

`CFStringCompare(string1, string2, options)`	Compare two CFStrings; use `UCCompareTextDefault` for `UniChar *`
`UCGetCollationKey(collator, text, len, ...)`	Get a key that can be binary compared (best for sorting large data sets)
`CFStringFind(target, search, options)`	Search a target CFString for a search string; also `CFStringFindAndReplace`
`CFStringFindCharacterFromSet(string, set, options, ...)`	Search a string for characters that are members of a `CFCharacterSet`

Transforming Text

- `CFStringTransform(string, transform, &range, reverse)` *New!*

`kCFStringTransformStripCombiningMarks`	Résumé ⟹ Resume
`kCFStringTransformToLatin`	Это будет हिन्दी ⟹ Éto budet hindī
`kCFStringTransformLatinHiragana`	kon'nichiha ⇔ こんにちは
`kCFStringTransformMandarinLatin`	上海 ⇔ shàng hăi
`kCFStringTransformToXMLHex`	Cool!☺ ⇔ Cool!☺

Truncating Text That Is Too…

`HIThemeDrawTextBox`	Truncate to width while drawing; storage unchanged
ATSUI `kATSULineTruncationTag`	Truncate to width while drawing; storage unchanged
`TruncateThemeText`	Truncate string in storage

Finding Text Boundaries

- `TextBreakLocator:UniChar *`

`UCCreateTextBreakLocator`	Create object for locale-sensitive text boundaries: character, cluster, word, line
`UCFindTextBreak`	Find the next or previous text break of the desired kinds
`CFStringGetRangeOfComposed CharactersAtIndex`	Find cluster break in CFString

Line break: Parlez-|vous |français ?

Word break: Parlez-vous français ?

Finding Properties of Characters

- CFCharacterSet
- UCGetCharProperty
- UCIsSurrogateHighCharacter
- UCIsSurrogateLowCharacter
- UCGetUnicodeScalarValueForSurrogatePair

```
// Example: Test whether a character is a decimal digit
UTF32Char char;
digits = CFCharacterSetGetPredefined(kCFCharacterSetDecimalDigit);
if (CFCharacterSetIsLongCharacterMember(digits, char))
    ...
```

Dates, Times, Numbers, and Calendars

http://developer.apple.com/wwdc2005/

Locales

- Represent conventions used for dates, times, numbers, calendars, currency, and units
- Distinct from UI language, collation order, text break behavior

`CFLocaleCopyCurrent()`	User's preferences from Formats pane
`CFLocaleCreateCanonicalLanguageIdentifierFromString`	Put language identifier in canonical form: "English" ⇒ "en"
`CFLocaleCreateCanonicalLocaleIdentifierFromString`	Put locale identifier in canonical form
`CFLocaleCreateComponentsFromLocaleIdentifier`	Pick out pieces of locale identifier; inverse available
`CFLocaleGetValue`	Get data associated with a locale, e.g. decimal
`CFLocaleCopyDisplayNameForPropertyValue`	Return localized name for value: ja ⇒ "Japanese", JP ⇒ "Japan", USD ⇒ "$"

Formatting/Scanning Dates and Times

- `CFDateFormatter`

`CFDateFormatterCreateStringWith AbsoluteTime(NULL, format, time)`	Format a date/time
`CFDateFormatterGetAbsoluteTime FromString(format, string, ...)`	Convert a date/time string to an absolute time
`CFDateFormatterSetProperty (format, key, value)`	Set properties of a CFDateFormatter

```
CFDateFormatterRef format = CFDateFormatterCreate(NULL, CFLocaleCopyCurrent(),
    kCFDateFormatterLongStyle, kCFDateFormatterLongStyle);
CFDateFormatterSetProperty(format, kCFDateFormatterIsLenient, kCFBooleanTrue);
CFDateFormatterGetAbsoluteTimeFromString(format, string, NULL, &time);
```

June 6, 2005

٦ يونيو, ٢٠٠٥

Computing Calendar Data

- CFAbsoluteTime
- CFCalendar New!

CFCalendarComposeAbsoluteTime	Convert a set of calendar values to an absolute time
CFCalendarDecomposeAbsoluteTime	Convert an absolute time to a set of calendar values
CFCalendarAddComponents	Modify individual calendar values that correspond to a CFAbsoluteTime (e.g., add one month)
CFCalendarGetFirstWeekday	Get first day of week for locale
CFCalendarGetRangeOfUnit	E.g., days in month, months in year at specific time; Feb 2000 ⇒ [1,29]

Formatting/Scanning Numbers

- `CFNumberFormatter`

`CFNumberFormatterCreateStringWith Value(NULL, formatter, type, &num)`	Format a number
`CFNumberFormatterGetValueFromString (formatter, string, ...)`	Extract a number from a string
`CFNumberFormatterSetFormat (formatter, format)`	Set format pattern string

```
CFNumberFormatterRef formatter = CFNumberFormatterCreate(NULL, CFLocaleCopyCurrent(),
    kCFNumberFormatterCurrencyStyle);
double cash = 42.0;
string = CFNumberFormatterCreateStringWithValue(NULL, formatter, kCFNumberDoubleType, &cash);
```

42,00 €

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Wrap Up

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Whom to Contact

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For More Information

http://developer.apple.com/wwdc2005/

Documentation, Sample Code, and Other Resources

http://developer.apple.com/wwdc2005/

Q&A

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